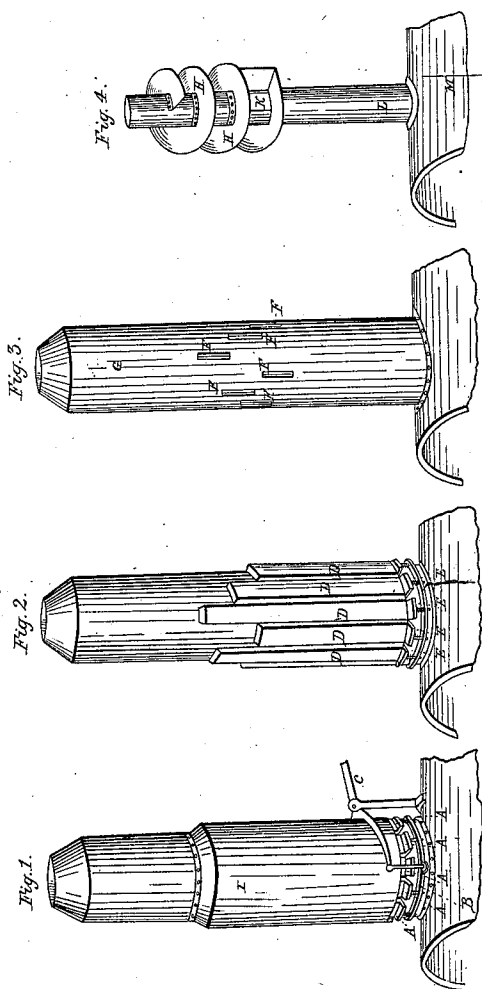


No 161,

J. Stimpson,

Spark Arrester,

Patented Apr. 17, 1837.



# UNITED STATES PATENT OFFICE.

JAMES STIMPSON, OF BALTIMORE, MARYLAND.

## CONSTRUCTION OF SMOKE-STACKS OF LOCOMOTIVE OR STATIONARY STEAM-ENGINES AND OTHER CHIMNEYS FOR PREVENTING THE ESCAPE OF SPARKS.

Specification of Letters Patent No. 161, dated April 17, 1837.

*To all whom it may concern:*

Be it known that I, JAMES STIMPSON, of the city and county of Baltimore and State of Maryland, have invented a new and improved mode of constructing Smoke-Stacks for Locomotive or Stationary Steam-Engines or Steamboats, and the flues of smith's and all other chimneys, &c., whereby to generate extra heat and to prevent the escape of sparks, ashes, cinders, soot and also in a very great degree of any perceptible quantity of smoke from their tops, which smoke-stack or flue I denominate, "the draft-accelerator and centrifugal spark-catcher;" and I do hereby declare that the following is a full and exact description.

The nature of my invention consists in passing the flue from a central pipe, formed as usual, spirally around said central pipe; into which, after several turns it may again reënter, or be discharged into a space formed by a jacket or covering which incloses said spiral flue. Through this jacket several openings are made for each turn of the spiral; each of said openings extending vertically the whole distance between each of the divisions of said spiral, and of a proper width to receive the cinders, &c. Each of these openings are covered by four sided receivers, of such a form and dimension, as when all are attached to the jacket will inclose the whole circumference of it; and the whole of these receivers may be inclosed by a thin sheet-iron covering, secured around them by means of mast-hoops, or otherwise.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation, viz:

I form a cylindrical flue pipe L, Figure 4, as usual, of a proper diameter for the object intended; and at a convenient distance above the boiler. I make an opening K in one side of said pipe, as large as the average size of the flue; the position of this opening for the commencement of the spirals, as to height above the fire, will be best determined by experience and convenience,—if too near the fire, it will become too hot and subject to burn out soon, if higher it will heat less, but with less heat of itself, will increase the draft by its height or altitude; and it may be made by cutting through and around three sides of it, viz: The side vertically adjacent to the inner periphery of the flue as

it winds up the ascent, and the side at each end of this,—that is the top and bottom upon an angle of inclination to agree with that of the ascent, and to be whole on the side opposite to the direction of the draft; then bend the piece out to meet the jacket which will form a guide and serve as a fender for the flame to strike against; and said opening vertically should be as long as it is intended to have the vertical height of each turn of the spiral flue. I then cut pieces of sheet-iron into circles, the diameters of which are equal to the whole diameter of the spiral flue, and cut out a round hole in the middle of each of these circles, as large as the diameter of the first mentioned pipe, minus what should be bent down to rivet it on to said pipe by; and if each spiral turn is intended to be one foot high, then add the length of its diagonal line of ascent to the inner circumference of the said iron circles, having allowed what is necessary to be bent down as before stated, and then cut out the hole accordingly. If this iron circle be in one piece, then cut through from its outer periphery on a line through the center of the circle to the inner periphery of the inner circle; then take another plate made in the same way, drop one of the cut edges below the other, and lap the edges of the two plates sufficiently to rivet them together in such a manner that their outer and inner edges shall be exactly even with each other. In this manner, add or rivet as many together as it is intended to have spiral turns of the flue; and I should recommend the spiral to be so formed, as to have the ascent go around with the sun, like a back-handed screw,—as nature inclines fluids, air, &c., to move when in a spiral or circular manner with the sun; and as it is as easy to make it ascend one way as the other, it would be best to let nature have her own way. These spirals H are then to be slipped onto the center pipe, drawn apart so as to set as tight as possible to it, and then riveted, or fastened to said pipe in any way preferred. But the riveting should be commenced at bottom first; say let it reach a little behind the opening and there commence; pass it along just even with the under edge of the opening; carry it around and return it just even with the upper edge of said opening, and so on until it is all made fast. Thus if the inner pipe be round

and straight and the holes inside of the iron circles or spirals of an exact size, the outer peripheries of the circles or spirals will all be as true as a common screw thread, and of an equal distance apart. I then inclose said spirals by another sheet-iron covering, which, for the sake of distinction I have called a jacket G Fig. 3; this jacket may extend upward from the top of the boiler, and be fastened to it, or may be fastened to the inner pipe, just below the lower spiral, and extend to the top of the stack if desired, but in that case must be closed at the bottom, tight around the center pipe, if it does not reach the boiler; or, the spiral flue being re-entered into the center pipe at top, the jacket may be discontinued just above the top of the spirals, the draft being stopped in the center pipe just below when the flue is returned into it; or again the center pipe may be discontinued just above the spirals, closed over to prevent the passage of any draft through it, and the spiral flue discharge within the jacket. This mode, I think, will be the best, and is the one I have tried and found very satisfactory in every respect. The outlet of the jacket at the top of the stack may be contracted to nearly the size of the inside pipe, which may be done by a partial cap connected to the outer edge of the jacket, and sloping inward and upward upon an angle of about 45 degrees. This contraction of the outlet is intended to cause a body of hot air to be confined by the eddy all around the inside of the jacket above the spirals, whereby from its extra heat to increase the draft; and by this formation of the top, a similar effect will also be produced when passing swiftly through the air.

At equi distances in each spiral turn, I cut three or four openings F through said jacket (varying in number according to the size of the stack or engine) each of which openings are to extend up and down from one division of the spiral to the other and terminate just even with the outer edges of the spirals; the openings may be two inches wide more or less, varying according to the magnitude of the engine. The inner edges of these openings should be bent out whereon to lodge, what I shall term receivers, D, Fig. 1, which receivers should be closely fitted, and as nearly tight upon the outlets as may be, to prevent the air from rushing in; as it would have a tendency to resist the sparks, ashes &c. from entering said receivers. If there are three spiral turns and four outlets in each turn, then there would be twelve receivers, and if the inside pipe is twelve inches in diameter, there would be in its area one hundred and thirteen square inches; therefore to obtain the same area in the spiral flue, if it should be necessary, it must be fourteen inches high by eight

inches wide, extending from the center; suppose this then to be the size adopted in any instance; the spiral flue of eight inches wide, around a twelve inch pipe, would increase the whole diameter, say to twenty-eight inches to the outside of the jacket, and that would give, say, eighty-eight inches in circumference; divide this number of inches by the twelve receivers, and the quotient is seven inches and a third for the width of each receiver on the side next the jacket, and if the receivers were three inches outwards, they would increase the whole circumference, say, to one hundred and six inches, therefore the receivers would then be each seven inches and a third for the side adjacent to the jacket, the opposite side nine inches, and three inches outward, which would cover the whole surface around the jacket. Said receivers may be made to extend from the outlet, as low as they can, so as to afford convenient room to be emptied so as to afford convenient room to be emptied of the cinders and ashes above the boiler and deck, &c. And may also be surrounded by a thin covering I, Fig. 1. Secured to them by mast-hoops or otherwise, to present a smooth and uniform surface with a sloping cap to close it to the inner jacket, immediately above the tops of the receivers, the inner jacket extending above the outer one and finished with a sloping cap; or the inner jacket may be discontinued immediately above the tops of the receivers, and the covering outside from the top of the stack finished with a cap at the top as before described. The bottom A of each of these receivers must be closed tight, which may be done by covers connected by hinges or otherwise, so that for locomotives they may all be opened simultaneously by means of a lever C connected to said covers by spring props; but for stationary engines, steamboats, &c. they may if preferred be separately opened; or they may be constructed in any other mode if desired. It should be borne in mind, that the outlets for the sparks through the jacket should not be cut immediately over one another, but above and at the side; that is to say, if four are made in the first spiral turn, then the next four should not be cut out in a line above the first, but advanced sufficiently from them and each other, to allow the receivers to pass down side by side as close to each other as they can, in this way causing them to cover the whole surface of the jacket. It will now be seen, that by the passage of the draft and flame up the central pipe from the furnace, thence out, around said central pipe and returning into it again at top, or discharging itself into the jacket, which forms the outside of the spiral flue, I obtain for the draft an ascending rotary movement equal to the ve-

locity of the draft; and by that a centrifugal force, in proportion to the velocity of the rotary movement; therefore every particle that has weight is inclined to fly off  
 5 upon lines of tangents and thereby to slide around against the inner periphery of the jacket; hence owing to the eddy and centrifugal force combined, as they pass the openings into the receivers (where from the  
 10 rarification of the air) said particles, however light will enter and fall down to the bottom. The receivers being much wider than the openings into them, the eddy formed by the passage of the draft by the  
 15 openings cannot extend to the exterior and corners of said receivers, hence the very lightest sparks, ashes and dust are at once forced beyond the periphery of the spiral draft and there deposited. I have tried  
 20 it from the lightest draft up to the blast of cupola steam bellows, and not a spark or a particle of ashes could be seen to escape from the top of a stack only four feet in height. It may also be seen that by the  
 25 formation of the stack at top, the centrifugal force of the flame or hot air against the jacket, the same passing up the central pipe as high as the top of the spirals, will also produce a heat, which will create an  
 30 extra draft, while the extra heat thus pro-

duced will consume the smoke and soot, which as far as it has been tried as yet by way of experiment, was highly satisfactory to all that witnessed it, and is believed to be the true principles; as it appears to  
 35 secure the ostensible object, and as must be evident to every reflecting mind, the draft if not materially increased, can never be choked or diminished, the flue being always open throughout. 40

What I claim as being new and my invention is—

The combination of the spiral flue with the outlets and receivers constructed as above set forth, or in any other manner, 45 whereby a centrifugal force is or shall be obtained between a furnace or fireplace, stove or grate and the top or superior part of a chimney stack or flue to prevent the escape of sparks &c. from said tops; but 50 without intending to confine myself to the precise form or dimension aforesaid, which I have given, that its nature and principles of construction and action may be understood.

JAMES STIMPSON.

Witnesses:

JAMES H. STIMPSON,  
 S. E. STIMPSON.